

Tourism Competitiveness Archetypes and the Frontier Distance Gaps of Uzbekistan

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Abstract. This study analyzes the tourism competitiveness archetypes and frontier destination gaps of Uzbekistan alongside ten leading tourism economies using metrics from the 2024 Travel and Tourism Development Index. By applying unsupervised principal component analysis and k-means clustering, this research reveals a distinct three-tier structure where advanced economies split into two high-performance variants, while Uzbekistan forms an isolated third cluster. The analysis shows that the primary principal component explains 84% of total profile variance, illustrating that the emerging destination faces a broad-based, structural deficit across all evaluation pillars rather than a localized weakness. This study provides recommendations for national policy architectures to move away from isolated single-pillar interventions and instead deploy integrated, multi-dimensional strategies that target balanced long-term upgrading across environmental sustainability, infrastructure, safety, and health frameworks.

Keywords: Tourism Competitiveness, Cluster Analysis, Principal Components, Archetypes, Destination Benchmarking.

I. INTRODUCTION

Comparisons of tourism competitiveness across countries are overwhelmingly univariate: a destination is said to lead on one pillar and lag on another, and its overall rank summarizes these into a single ordinal. What such comparison cannot reveal is structure - whether destinations fall into distinct multivariate types, and where a given country sits within that typology. Yet structure is what policy needs, because a country learns most from the peer group it actually resembles and converges most efficiently toward an archetype rather than toward a single leader.

This paper recovers that structure for a set of ten leading tourism economies and Uzbekistan, using their multivariate competitiveness profiles rather than any single score. By applying principal component analysis and clustering to the overall index and four sub-indices, it asks two questions: do these economies fall into distinct competitiveness archetypes, and where, within the resulting typology, does Uzbekistan lie. The inclusion of Uzbekistan alongside the advanced economies is deliberate: it positions the country not against a curated peer group but against the global frontier of the sector, allowing the magnitude and shape of its distance from that frontier to be measured multivariately.

The contribution is methodological and substantive. Methodologically, the paper demonstrates the application of unsupervised multivariate methods to competitiveness profiling, complementing the index-and-ranking tradition. Substantively, it characterizes the archetype structure of leading

tourism economies and locates Uzbekistan within it, showing that its gap to the frontier is broad-based rather than dimension-specific. The paper follows the IMRAD structure.

2. Literature review

The measurement of destination competitiveness through composite indices, founded on the models of Ritchie and Crouch [1] and Dwyer and Kim [2], has matured into a substantial methodological literature. Gooroochurn and Sugiyarto [3] derived index weights through factor analysis, Mazanec and colleagues [4] probed the explanatory structure of competitiveness monitors, and Mendola and Volo [5] provided a systematic treatment of composite-indicator construction, all of which point to the multivariate nature of competitiveness and the value of methods that exploit it. The present study takes this multivariate logic to its natural conclusion by clustering destinations on their full profiles rather than ranking them on an aggregate.

Multivariate and unsupervised methods have an established, if under-exploited, place in tourism analysis. Zhang and colleagues [6] applied TOPSIS and information entropy to destination competitiveness, Assaf and Josiassen [7] brought frontier and efficiency methods to bear on tourism performance, and Albaladejo and colleagues [8] combined clustering with panel causality to show that the tourism-growth relationship is cluster-specific. Cracolici and Nijkamp [9] demonstrated the value of multivariate indicator-based profiling at the regional scale. These studies establish both the feasibility and the diagnostic payoff of grouping destinations by multivariate profile, the approach adopted here at the cross-country scale.

A final strand connects competitiveness structure to outcomes. Uyar and colleagues [10] and Pavlukovic and colleagues [11] confirm the explanatory relevance of competitiveness indices for sector development, while Webster and Ivanov [12] and Ivanov and Webster [13] show the conditionality of the competitiveness-to-benefit link. Crouch's [14] attribute ranking and Croes [15]'s small-destination work further emphasize that competitiveness is a structured, decomposable construct. Cluster-based positioning of a Central Asian economy against the global frontier has not previously been undertaken, and this study addresses that gap.

3. MATERIALS AND METHODS

3.1. Data and variables

The dataset comprises eleven economies - the United States, Spain, Japan, Australia, France, Germany, the United Kingdom, Italy, Canada and Switzerland, together with Uzbekistan - each described by five 2024 Travel and Tourism Development Index variables: the overall competitiveness index and four sub-indices covering policy and enabling conditions, environmental sustainability, safety and security, and health and hygiene. All variables are measured on the

common 1-7 scale. The ten advanced economies represent the global frontier of the sector, so the dataset positions Uzbekistan directly against best-attainable multivariate profiles.

3.2. Standardization and dimensionality reduction

Because the variables, though sharing a scale, differ in dispersion, each is standardized to zero mean and unit variance prior to analysis, so that no dimension dominates the distance metric by virtue of its spread. Principal component analysis is then applied to the standardized matrix to summarize the five-dimensional profiles in a low-dimensional space and to visualize the configuration of economies; the first two components are retained for display, and the variance each explains is reported.

3.3. Clustering

Economies are partitioned by k-means clustering on the standardized profiles, with the number of clusters set to three to correspond to the leaders-performers-emerging structure anticipated from the index distribution and to retain interpretability given the sample size. The algorithm is run from multiple random initializations and the lowest-inertia solution retained. Clusters are then ordered and labelled by their mean overall index, and their defining characteristics are read from the cluster centroids. The robustness of the assignment is assessed visually against the principal-component configuration.

4. RESULTS

4.1. The principal-component configuration

Figure 1 displays the eleven economies in the plane of the first two principal components. The first component, which alone accounts for the majority of total variance, orders the economies almost monotonically from the high-performing advanced group to Uzbekistan, and is interpretable as a general competitiveness axis on which all five variables load positively. Uzbekistan is separated from every advanced economy by a wide margin along this axis, occupying an isolated position at one extreme of the configuration. The second component, capturing residual profile differences among the advanced economies, distinguishes them by the relative emphasis of their sub-indices but does not bring Uzbekistan closer to the group.

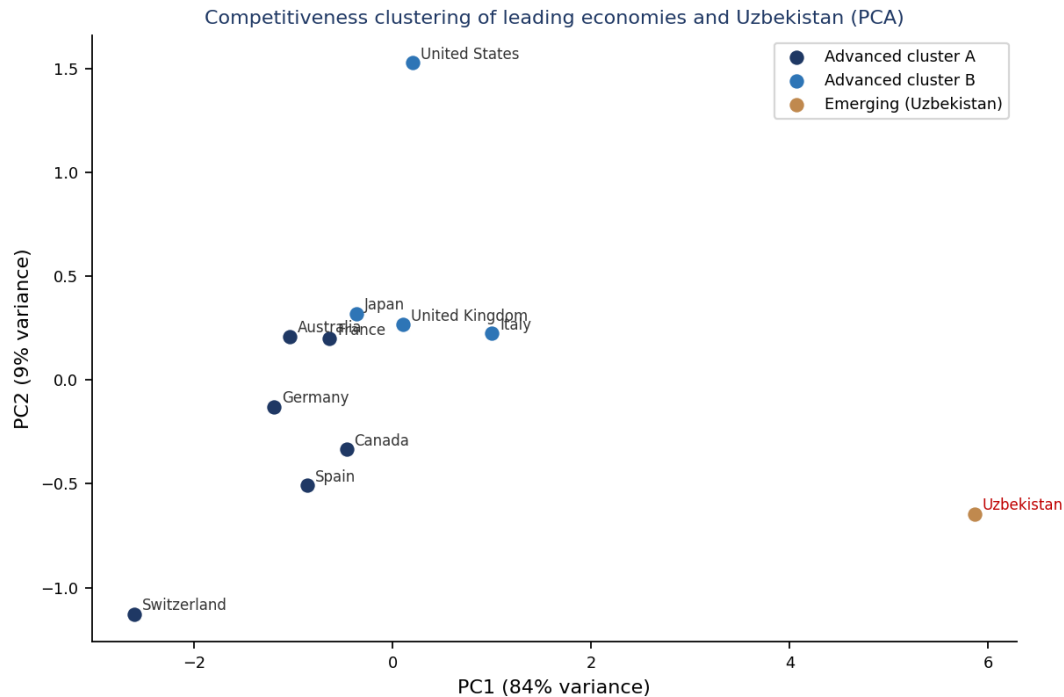


Figure 1. Principal-component configuration of the eleven economies, coloured by cluster.

4.2. The archetype structure

The clustering (Table 1, Figures 2 and 3) recovers a clear archetype structure. The ten advanced economies divide into two adjacent clusters that differ by profile emphasis rather than by a strict quality ranking - one slightly more balanced across safety, health and sustainability, the other led by a high overall index with comparatively lower sub-index uniformity - so that the two advanced clusters should be read as profile variants of a common high-performance type rather than as a quality hierarchy. The decisive division is the third cluster, which contains Uzbekistan alone, confirming that within this frontier-anchored sample Uzbekistan is not a marginal member of an advanced cluster but a distinct archetype in its own right. The mean cluster profiles in Figure 2 show the emerging cluster sitting roughly one-and-a-half to two index points below both advanced clusters on every dimension.

Table 1. Competitiveness profiles and cluster assignment of the eleven economies.

Economy	TTDI	Policy	Environ.	Safety	Health	Cluster
United States	5.54	5.71	4.98	5.26	5.56	Advanced cluster B
Australia	5.43	5.65	5.36	5.82	6.05	Advanced cluster A
Spain	5.40	5.31	5.44	6.10	5.87	Advanced cluster A
Japan	5.38	5.36	5.12	5.48	6.32	Advanced cluster B
France	5.36	5.49	5.51	5.56	5.94	Advanced cluster A
Switzerland	5.33	5.68	5.87	6.38	6.63	Advanced cluster A
Germany	5.30	5.61	5.63	5.74	6.15	Advanced cluster A
United Kingdom	5.08	5.54	5.36	5.42	5.68	Advanced cluster B
Italy	4.96	5.28	5.05	5.31	5.60	Advanced cluster B
Canada	4.92	5.76	5.28	5.97	5.76	Advanced cluster A
Uzbekistan	3.76	4.10	4.20	4.55	4.60	Emerging (Uzbekistan)

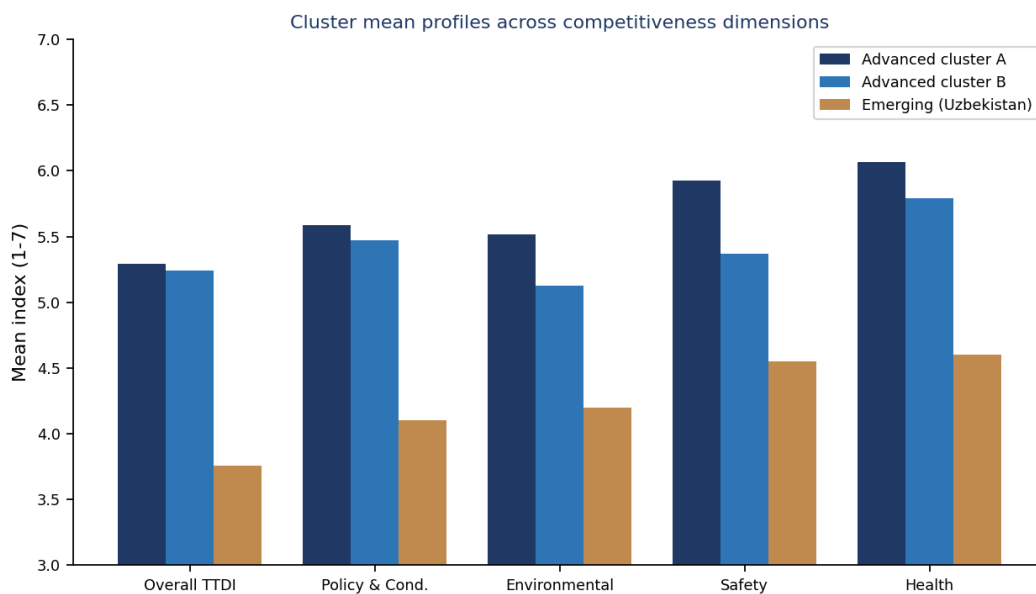


Figure 2. Cluster mean profiles across the five competitiveness dimensions.

4.3. The breadth of Uzbekistan's gap

Figures 3 and 4 make explicit that Uzbekistan's separation is broad-based. The ranked overall index (Figure 3) places Uzbekistan well below the advanced cluster, and the standardized heatmap (Figure 4) shows that its profile is uniformly and substantially below the sample mean on every one of the five dimensions, with z-scores around or below minus two throughout. There is no dimension on

which Uzbekistan approaches the advanced economies, which is precisely what distinguishes a genuine archetype difference from a profile that is merely lower on average. The gap is thus structural rather than attributable to one or two weak pillars.

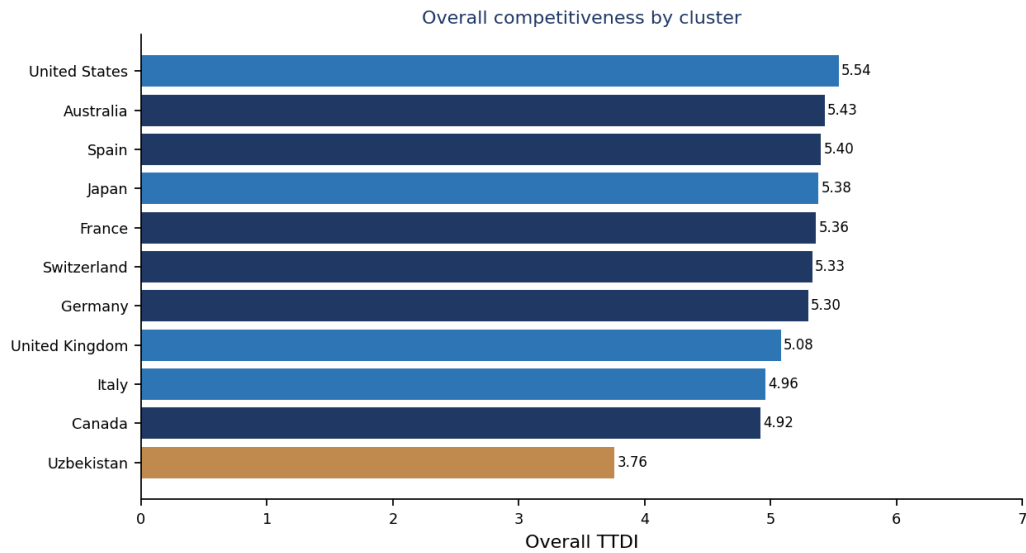


Figure 3. Overall competitiveness ranked and coloured by cluster.

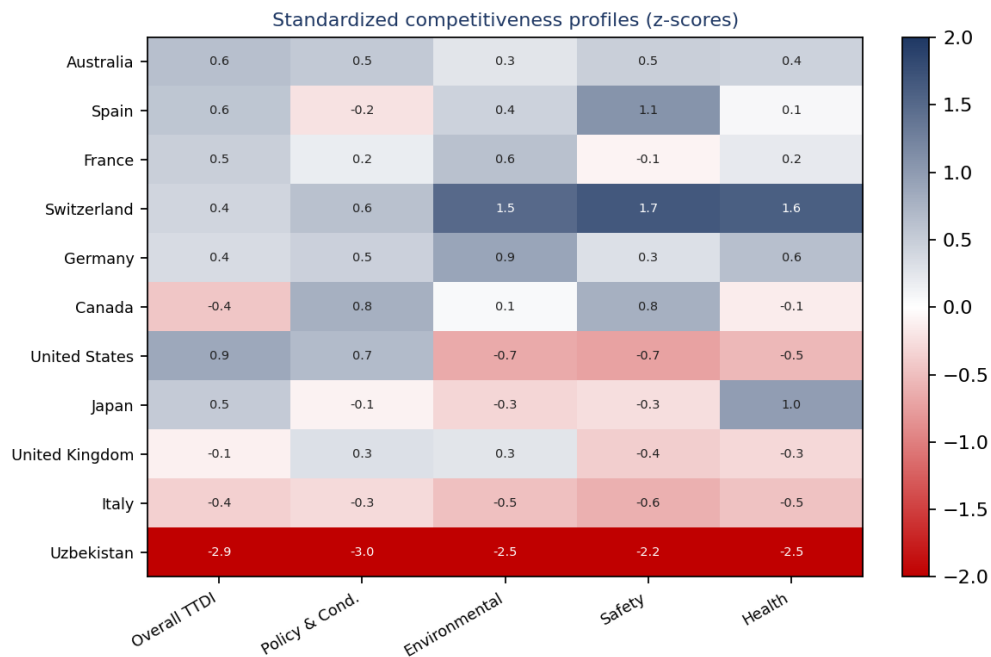


Figure 4. Standardized (z-score) competitiveness profiles, ordered by cluster.

5. Discussion

The archetype structure carries a sobering but clarifying message for Uzbekistan. Benchmarked against the global frontier rather than against regional peers, the country is revealed as a distinct competitiveness type whose distance from the advanced archetype is broad-based, spanning policy, sustainability, safety and health alike. This breadth is diagnostically important: it implies that

convergence toward the advanced archetype cannot be achieved by repairing a single weak dimension but requires coordinated, multi-dimensional advance. A strategy targeting one pillar in isolation would move Uzbekistan along a single axis while leaving its archetype position essentially unchanged.

At the same time, the multivariate framing offers a more constructive target than a single leader. Because the advanced economies form a coherent cluster rather than a scatter, the relevant aspiration is convergence toward an archetype - a balanced, uniformly high profile - rather than imitation of any one country's idiosyncratic emphasis. This aligns with the index-construction literature's insistence that competitiveness is a multivariate construct and with Albaladejo and colleagues [8]' finding that development dynamics are cluster-specific: Uzbekistan's path runs toward the common high-performance type shared by both advanced clusters, whose balanced profiles indicate the proportions in which the dimensions must advance together.

For policy, the analysis reframes target-setting around peer groups rather than point comparisons. The balanced, uniformly high profile shared by the advanced clusters, rather than any single leader, constitutes Uzbekistan's aspiration, and the modest differences between the two advanced clusters indicate the profile latitude that a high-performance type permits. The breadth of the current gap also implies that competitiveness gains will be gradual and cumulative rather than achievable through any single reform, reinforcing the case for a sustained, balanced development programme of the kind the companion studies in this research programme specify in greater detail.

Three limitations qualify the findings. The sample is small and deliberately frontier-weighted, so the archetype structure describes the relationship between Uzbekistan and the leaders rather than a representative global typology; a larger, more balanced sample would yield a richer set of archetypes. The analysis uses five dimensions; incorporating the full pillar set would refine the cluster boundaries. And the clustering is cross-sectional, so it captures position rather than trajectory. A larger panel with the complete pillar set and a temporal dimension is the natural extension.

6. CONCLUSION

Applying multivariate clustering to the competitiveness profiles of leading tourism economies and Uzbekistan reveals a clear three-tier archetype structure and locates Uzbekistan as a distinct emerging type, separated from the advanced cluster by a wide and broad-based margin along the dominant competitiveness axis. The country's gap to the frontier is structural - present on every dimension - rather than concentrated, implying that convergence requires coordinated, multi-

dimensional advance toward the balanced profile that characterizes the advanced archetype. By replacing point comparison with peer-group structure, the analysis supplies Uzbekistan with a realistic aspiration - the balanced high-performance profile shared by the advanced clusters - and a frame within which to sequence its long-run convergence toward the global frontier.

Foundational and applied contributions to destination-competitiveness measurement further underpin the present framework, including [16].

The study's quantitative orientation is additionally informed by the tourism demand-forecasting literature, notably [17].

The wider literature on tourism-led growth, economic contribution and sector resilience also frames this study, including [18].

Evidence on the infrastructure-tourism relationship also bears on the analysis, including [19].

Research on tourism sustainability and smart, digital destination development likewise informs this study, including [20].

Declarations

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Data availability. The macro-level (Travel and Tourism Development Index) and meso-level regional datasets analysed in this study are derived from the author's Doctor of Science (DSc) dissertation research and are available from the author upon reasonable request.

Conflicts of interest. The author declares no conflict of interest.

Author contributions. The single author conceived the study, assembled and analysed the data, and wrote the manuscript.

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